Limitations of Magnetic Resonance Imaging in the Diagnosis of Osteomyelitis Underlying Diabetic Foot Ulcers

To the Editor—We read with interest the meta-analysis by Dihn et al. [1] in which the diagnostic modalities of osteomyelitis underlying diabetic foot ulcers were systematically reviewed. In their methodologically rigorous study, the authors concluded that MRI was the most accurate imaging method (pooled sensitivity, 0.90 [95% CI, 0.82–0.95]; pooled specificity, 0.79 [95% CI, 0.62–0.91]; and Q*, 0.74)—findings similar to those in previously published studies [2]. However, these results do not address the problem that the diagnostic performance of MRI may vary significantly across different regions of the foot because of spectrum bias.

In the only analysis, to our knowledge, to offer detailed correlation of MRI findings with histologic findings in surgically resected tissue, Craig et al. [3] evaluated 13 patients with diabetes mellitus who underwent MRI of the foot prior to partial amputation for suspected osteomyelitis. The reported sensitivity and specificity of MRI were 90% and 71%, respectively—similar to the findings of Dihn et al. [1]. However, the study’s unique design yielded 2 interesting observations. First, of 18 bones that demonstrated only marrow edema (i.e., without associated osteomyelitis) during histologic examination, 100% demonstrated changes on MRI that were indistinguishable from osteomyelitis. Second, tarsal bones appeared to pose a particular diagnostic challenge. In all, 12 tarsal bones were resected, and 9 of these had abnormal MRI findings. A histopathologic diagnosis of osteomyelitis was made for only 4 of these 9 bones; the other 5 bones had marrow edema, without associated osteomyelitis, and the 3 tarsal bones with normal MRI findings were histologically unremarkable. Thus, the specificity of abnormal MRI findings when only tarsal bones are considered decreases to only 37.5%—a number that depends greatly on the prevalence of bones with marrow edema. Moreover, 3 patients had increased signal intensity in tarsal areas that were remote from a site of osteomyelitis in the forefoot. Although these tarsal bones were not resected (and, thus, were not included in the aforementioned calculation), there was no evidence of tarsal osteomyelitis after 6 months of clinical follow-up. However, antibiotic treatment was not reported. Inclusion of these cases as false-positive results would further decrease the specificity of MRI to 27.3%. It is notable that these patients’ tarsal bones, which yielded false-positive MRI results, did not have any adjacent soft-tissue inflammation detected by imaging studies, suggesting that this feature is helpful in ruling out osteomyelitis.

Lipman et al. [4] prospectively studied 20 consecutive patients with peripheral neuropathy and suspected osteomyelitis, using bone biopsy findings as the reference standard in 16 of 20 patients. When these investigators considered mid- or hind-foot osteomyelitis in isolation, MRI was found to have a sensitivity of 83% and a specificity of only 40%. Specificity for the forefoot could not be calculated, because all 12 patients with abnormal MRI findings in the forefoot had osteomyelitis noted by biopsy. Detection of osteomyelitis in 6 patients with Charcot joints was especially problematic, with a sensitivity of 100% and a specificity of only 25%.

Although both of these studies have methodological limitations that may have precluded their formal inclusion in the meta-analysis by Dihn et al. [1], we believe that they provide a plausible caveat to the interpretation of MRI findings for the diagnosis of osteomyelitis in the hind-foot.

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References


Is Dengue Virus Infection An Occupational Health Problem?

To the Editor—A noted increase in the incidence of adult dengue virus infection in Thailand has occurred despite improved vector-control strategies [1]. Adults at increased risk for dengue virus infection include health care workers (HCWs) in hospitals with excess standing-water sources. Only rarely have there been...